PEOPLE, LAND AND WATER

A Review of the PLAW Program Initiative of IDRC

Review Team

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Executive Summary

The reviewers strongly endorse the priority given by the People, Land and Water (PLaW) Program Initiative (PI) to the goal of promoting 'the equitable, sustainable and productive utilization of land and water resources by rural women and men in stressed ecoregions of Africa and the Middle East in order to enhance their income, food and water security'. The reviewers also believe that the objectives which the PI team have identified as the means whereby IDRC can contribute to this long-term goal are appropriate to the task.

The PLaW Prospectus is clearly the result of extensive reflection on the part of the PI team members. It gives much evidence that PLaW PI team members have digested and synthesized the lessons of many years of direct research for development experience. In bringing together three on-going clusters of projects, the PLaW PI has succeeded in developing a coherent whole which appears to go beyond a simple aggregation of prior objectives. There is also much evidence of the PI team members engaging in extensive consultations with others interested in the same problematique of sustainable land and water utilization.

The review team endorses the Prospectus's placing of issues of food and water security within the framework of people's access to resources and is also pleased to note the importance accorded by the PI team to systemic and external factors in identifying both causes and possible solutions to the problems being addressed. Given these elements, the PI's focus on linking equity and efficiency considerations, and the fact that a policy orientation is a critical component of the PLaW program, the review team recommends that the PLaW team addresses issues of conflict resolution, at scales ranging from the international to the community, more explicitly in its Prospectus.

The reviewers were also highly impressed with the nature and extent of accomplishments of the PI team. The number and variety of activities funded by the PI, the extent of outputs produced by the recipients, and the initiatives in which the team members themselves are directly engaged, are truly impressive.

The review team recommends that the PLaW PI place greater emphasis on questions of reach and impact as programming criteria. It should therefore take on the challenge of working with others in evolving tools and processes which allow tested and validated knowledge to be made available to end-users in accessible format, thereby enabling and empowering them to exercise choice.

1.Research Approach

1.1 Development problematique and conceptualization of research

At its inception, the People, Land and Water (PLaW) Program Initiative (PI) faced the enormous challenge of amalgamating three research clusters: Desertification, Dryland Water Management, and Sustainable Production Systems and Policies. It has been one of the PLaW team's major achievements to build a coherent Prospectus which goes beyond a simple aggregation of its parts. It has achieved this through extensive consultations carried out between 1996 and 1997 with research partners in the three clusters, international researchers and members of NGOs. The team also consulted with the Gender and Sustainable Development Unit at IDRC.

The PLaW PI focus is the problematique of land and water management in Africa and the Middle East. The review team strongly endorses the priority given by IDRC and the PLaW PI to this issue. Land and water resources are two foundations on which economic and social welfare are built. Their proper use is a pre-condition for sustainable development. Access to land and water resources could in addition be a prime spark for future conflicts.

The PI Prospectus makes a very credible effort in describing in a few pages this complex issue for an immense and highly heterogeneous region. The heterogeneity extends from the biophysical, to climatic, social, cultural, economic and political conditions. The central objective of the new PI, as stated in the Prospectus (PLaW 1997:5), is 'to promote the equitable, sustainable and productive utilization of land and water resources by rural women and men in stressed ecoregions of Africa and the Middle East in order to enhance their income, food and water security'. Soil productivity and water demand management are the 'entry points' (PLaW 1997:5) for addressing, respectively, food security and water security.

The Prospectus identifies in general terms some of the causes of the problems, e.g. limited per capita 'endowment' of land and water (although this is highly variable from location to location), overuse and pollution of existing resources (PLaW 1997: PLaW 1997/1998). Importantly, it is recognised, albeit briefly, that questions of food security and water security are embedded in the political economy. The Prospectus does not go into detail here, but does note the unequal distribution of resources, market pressures and 'policies that reinforce those pressures', *inter alia*. The Prospectus also observes, on the basis of examples from Kenya and Niger, the need to question the commonly held assumption of the relationship between 'population density or poverty' and land degradation. What this signifies at the conceptual level is an engagement with the difficult process of moving from a so-called efficiency orientation in research to one which links questions of equity (primarily class and gender) and the environment with those of efficiency in the search for sustainability. One of the challenges the PI faces at the conceptual level is the development of analytical tools which can further inform an understanding of social relations, in all their diversity, as these interrelate with the environment at the local level as it is

here, rightly, that the PI focuses its attention with respect to food and water security. In both conceptual and practical terms, the difficult challenge is to engage in a meaningful way in research informed by both the biophysical and social sciences.

The reviewers strongly endorse the location of issues of food security and water security within the broad framework of people's access to resources and decision-making at the community level. Following from this people-centred, rather than technology-driven, approach, it is important to recognise, as the Prospectus does, that people must be active participants in resolving the problems they face. It is their knowledge that is vital in the search for solutions. A challenge facing researchers here is to ensure the participation of people differently located with respect to natural resources in the community i.e. taking into account such axes of difference as class, gender, age and ethnicity. Communities no more than households are homogeneous entities and research based at this level needs to engage in careful social analysis which recognises the frequently complex intersection of such differences as class, gender, age or ethnicity with respect to access to and control of natural resources. A further challenge is to explore the ways in which what goes on at the intra-household and community levels is connected to processes of globalization - most obviously in Sub-Saharan Africa (SSA) with respect to policies associated with structural adjustment.

The direction that the new research is taking is very much in line with the commitment in the Corporate Program Framework (CPF) to 'environmental sustainability and social equity' (IDRC 1997:7) through a multidisciplinary approach to research support and management. There is solid evidence that the work of the PLaW initiative relates directly to the six themes identified in the CPF. One of the most interesting challenges with respect to the CPF in the future may be to expand research into decision-making processes 'that integrate environmental, social and economic objectives ..., especially where ownership lines are unclear (as with common property resources) or where the ownership is divided (as with rivers and aquifers that cross national boundaries)' (IDRC 1997:19).

The subject of conflict resolution with regard to resource use is mentioned briefly in the Prospectus (PLaW 1996:7). Pressures on scarce resources can and do lead to conflict. Highly inequitable access to resources is a cause of unsustainable resource use, as are threats to locally managed common property resources through privatization of tenure. Gender is frequently important in understanding questions of tenure and sustainability as is socio-economic difference. Attempts to deal with these and other property relations can be very politically charged. The PI does have some experience in dealing with such delicate situations, the Joint Israeli-Palestinian Management of the Mountain Aquifer being one example. It may be appropriate, therefore, to address the issue of conflict resolution at different scales of social interaction more explicitly in the Prospectus and, in view of the close relationship between property regimes and sustainability, to engage with this issue more comprehensively in the conceptualisation of the research.

The term 'incentives' appears on several occasions in the Prospectus (pp. 3,7) with reference to

avenues to explore in promoting more sustainable land and water use patterns. One of the reviewers (GS) is highly supportive of this, believing that without economic or other incentives it is highly unlikely to bring about major behavioural or attitudinal changes. Incentives which need to be explored can be both internal to the rural system under study or external to it. The former seeks to associate economic benefit directly with more sustainable resource use patterns, the latter usually involves transfers of resources from surplus areas elsewhere towards the rural system in question. Research designed to provide substantiation to policy makers of the importance of incentives (and disincentives) would therefore be useful. It will be quite relevant, for example, in the work of the Water Demand Management Research Network described below.

1.2 Research objectives

The Workplan for the three year period 1997 - 2000 was negotiated in Kabale, Uganda (January 1997), with the team of the African Highlands Initiative and members of NGOs. A commitment to an ongoing process of dialogue among the different actors is evident in the statement of research objectives and the methodology which informs the research.

The reviewers strongly endorse the step-wise process oriented approach, linking research with the development of policy and communication strategies. Thus, the first objective, 'to enhance understanding and knowledge to manage the systemic and external factors that lead to degradation or improvement in the productive and service capacity of land and water resources' leads to the second, 'local and national policies and institutional arrangements that equitably increase access, availability, and quality of land and water resources'. The third objective is 'to develop or use communication strategies that facilitate the exchange of information and knowledge among stakeholders and foster participation in development initiatives'(PLaW 1997:7).

A focus on policy and communication is critical in terms of the overall goal of the PI. The reviewers strongly support the emphasis on communication as an integral component of research design and PLaW's concern to involve local NGOs and community organisations in this process. Such partnerships take time to develop. It is in light of this emphasis that it may be important to rethink the omission identified earlier with respect to making conflict resolution an explicit objective of the research. There is evident difficulty in working in a policy arena where deeply vested interests are at play. This concern becomes more salient in the move from technology-oriented to people-centred research. Conflict resolution may frequently also be an issue with respect to the development and use of appropriate communication strategies for the exchange of information and knowledge. The reviewers strongly support the direct participation of individuals and communities in decision-making related to research and development efforts which affect them but recognise that communities are highly differentiated units and contain people with very diverse interests.

1.3 Research Focus

Given the extent of land and water degradation in Africa and the Middle East, the PLaW team faces the question of whether to focus its activities or to disperse them. From the Prospectus, a review of the projects funded and discussions with the team leader, it is evident that the PI team has chosen to do the latter in order to maximise not so much the direct impact of its work but the indirect impact which may accrue through the uptake by others of cutting edge methodological approaches used in the activities it supports, an approach supported by the reviewers.

Within the context of providing support to a variety of activities, the PI team has nevertheless chosen to have some focus according to issue, sector and ecosystem, an eminently justifiable decision in view of the heterogeneity of the territory covered. With regard to 'research issue', the Prospectus indicates appropriately that the focus will be on food and water security, specifically, 'soil productivity' and 'water demand management'. With respect to the first issue, low soil fertility in many parts of Sub-Saharan Africa is a recognised cause of low levels of agricultural productivity. In turn, it is recognised that the question of soil productivity depends both on biophysical factors and on social and political issues. Second, with respect to water security, and given the extent of attention to the 'supply' side of the water problematique, it is appropriate for the PLaW PI to focus on the side of demand management. But the real challenge may not be so much to replace one approach with the other, but to ensure that appropriate and complete analyses of options are brought to bear on particular situations. As projects such as the Water Demand Management Research Network gain experience and credibility, what constitutes revolutionary change will be the evolution of analytical and policy tools which allow decision-makers to make choices fully informed by both supply and demand perspectives.

The PLaW PI has chosen to direct much of its attention to semi-arid zones given their wide dispersion in the whole of Africa and the Middle East. In addition the PI has chosen to address problems in a second ecosystem in specific geographic areas: arid lands in MENA, highlands in East and Central Africa, sub-humid lands in West Africa and sub-humid areas in Southern Africa. The reviewers agree with these choices. Within each ecosystem, rural rather than urban areas are the focus of attention, although the Prospectus (1997:11) does indicate a need to examine the link between rural and urban areas with respect to the management of water resources. In light of the overall objective of the PI, the reviewers endorse this orientation but recognise the concern voiced by several Program Officers that the rural-urban divide can pose a problem with respect to water demand management. In the words of one PO, 'Ultimately, sooner in the Middle East than in some African countries, it will be ineffective to address water and agriculture separately in urban and rural areas'. In resolving this issue, it may be advisable to take explicit cognisance of regional difference and adjust research focus accordingly, linking, as appropriate, with other PIs in the development of further research.

1.4 Research methodology

In view of the complex research terrain within which questions of food and water security are embedded, it makes eminent sense to proceed on the basis of a multidisciplinary team of program officers. The PLaW team draws on substantial depth and breadth of experience, the background of its members spanning the physical sciences, social sciences and engineering. Within the PI, there is very strong support for the team and the general view is that the team itself is one of the remarkable successes of the PI. It works. This is no mean feat given the diversity of backgrounds of team members and, in the words of one PO, the need to spend time 'developing a common language and a common framework'. The team is led from a regional office, with membership in five of IDRC's eight offices, in itself 'a considerable bureaucratic achievement', to quote from one team member. Within the team, there is evidence of very real respect for the principle of multidisciplinarity and, in the words of John Hardie (1998:1), of engaging in a form of knowledge production which is 'applied; transdisciplinary; heterogeneous; non-hierarchical ...; and more socially accountable and reflexive' than the reductionist model which continues to inform so much research. The structure of the PI and its reliance on a team approach puts it in an excellent position to foster what Hardie (1998:2, 3) refers to as *'de facto* ("virtual") research communities which transcend national boundaries' and of encouraging research whose 'aggregate effect [is] greater than the sum of the individual projects'. At the same time, ensuring team involvement in project development is labour intensive. At least two people are identified per project, frequently the number being three or four. In addition, the follow up required for work in the area of capacity building, which is a key part of PLaW, is also labour intensive. It is not clear from the Prospectus how much time each team member contributes to the PI but, in calculating work loads, the different types of demands of a team approach to research management need to be recognised.

One of the issues faced in supporting multidisciplinary research, or other research which is pushing forward methodological boundaries, such as that involving participatory approaches or the integration of social and gender analysis, is the research capacity on the ground to carry out this work. If partner researchers do not have the appropriate methodological skills, knowledge, or attitudes, then they will at times be unable to undertake the increasingly complex tasks negotiated. Given the relatively weak (and resource-poor) institutional base in the region, coupled with the pressure to demonstrate outputs and impact, PLaW is confronted with the choice of whether to concentrate its efforts on stronger research institutions which will ensure high quality research, or to consider institutional strengthening as one of its objectives and therefore seek to work with weaker institutions. From the Prospectus, PLaW's position in this matter is not clear. It is evident from the Prospectus, however, that the PLaW PI recognises these concerns and has made capacity building a key component in many research projects. The review team notes that several pipeline projects have training as their principal objective e.g. Capacity Building for Monitoring, Evaluation and Social Analysis in NRM.

Recognising IDRC's limited budgetary resources, one reviewer (GS) recommends that the PLaW PI provide major support to large-scale training or capacity building only in exceptional

circumstances. This reviewer suggests that IDRC actively seek to encourage others with more resources to invest in training and capacity building activities which would be supportive of, or complementary to, IDRC's own research support. Within the context of specific project activities supported by IDRC, ensuring adequate human resource capacity should be an integral part of project planning. This might involve on-the-job capacity building or backstopping by stronger national or international institutions.

Appropriately, in terms of building research capacity, the Prospectus (1997:13) identifies explicit support for researchers who are working in a multidisciplinary mode and who are responsive to incorporating social and gender analysis in research into natural resource management. The PI is now involved in 'third generation' type training, developing the capacity for training which was supported earlier. The approach is innovative in several respects, for example with respect to the capacity building of community based organisations, working with people at the grassroots, for example, women's groups and local non-governmental organisations. If the ownership of knowledge is indeed central to the reconfiguration of relations of power, then this approach is vital. The Prospectus recognises the necessity for local participation in decision making, in the identification of the research problem and involvement in the research process, and in the identification of local knowledge. This approach is congruent with the conceptual issue of the centrality of the community for natural resource management. It will always be a challenge to work towards equity in carrying out participatory research and to engage community members with no research experience in the research process.

The team is also to be commended for its comprehensive approach to the analysis of gender. The Prospectus (1997:14) recognises the necessity to connect gender analysis with broader social analysis, noting that the category 'women' is not an adequate analytical category. There is significant diversity among women related, *inter alia*, to income level and age. The task for the specific research projects is to operationalise this insight and to ensure that it is gender, rather than 'women', that is the focus of concern, in the context of other social relations. There is also the challenge, noted by program officers, of 'scaling up'. Research which investigates intrahousehold and other social relations at the level of the community inevitably demands at least a component which engages in in-depth qualitative research. There is a need 'to go deep', in the words of one PO. The question then arises as to what inferences can be made on the basis of such a case study. It may the case that in certain instances it is appropriate to 'bring in the statistician' but, in view of the complexity of analysing relations between people and the environment, it may well be useful to consider other options. For example, one way of 'scaling up' would be, in line with suggestions made earlier, to examine small scale events iteratively in relation to larger scale process. At each stage in the analysis, the question would be asked, for example, how a specific event such as women's withdrawal of labour from soil conservation practices might be related to issues of security of land tenure (with respect to class and gender) or to changes in crop prices under structural adjustment policies. The objective of such research would not be to come up with broad generalisations, but to understand the processes at work in terms of land management which change in relation to changes in the broader political economy. From an understanding of the diversity of people's experiences in specific contexts may come a much more sophisticated understanding of the power relations at play.

It may be stating the obvious, but developing policy in the area of natural resource management - whether it concerns land or water - is a profoundly political matter, and if PLaW is to live up to its commitment to engage in research which leads to greater social equity, there are difficult issues to be addressed. Inevitably, research which recognises the political nature of the relationship between people and the environment, and which moves from an efficiency focus to one on equity, means choosing 'difficult' projects. In this context, it seems even more important to recognise conflict resolution as an explicit objective of the PI.

There are clearly risks in adopting this approach, but conflict resolution is in many respects integrally related to the implementation of participatory research which is accountable to all the participants. Risk taking, as is noted in *Empowerment Through Knowledge* (IDRC 1991:19), is closely linked to the ability to innovate and to being 'at the leading edge of research for development'.

'Scaling up' is also achieved through support for the development of networks engaged in parallel research, and the PLaW Initiative has extensive experience here. Again, the objective may not be to generalize, but to share the diversity of experiences in relation to a research topic. From a more profound understanding of the relationship between people and the environment is likely to come greater opportunity for resolving questions of food and water security.

1.5 Comparative advantage: PLaW and its partners

PLaW's comparative advantage, recognised in the Prospectus, rests on its experience in linking the goals of research to the formulation of policy and communication. It has had particular experience in building networks which bring together people with research experience with members of local communities in the search for solutions to problems. Research partners, established through long engagement with the research questions, include national agricultural research systems, NGOs, local and national public institutions, international agricultural research centres and universities. Within this community, PLaW has been influential in expanding research into natural resource management to include socio-economic issues, gender and communication. This expansion has led to important initiatives including the CGIAR co-ordinated eco-regional initiatives which focus on land degradation in specific ecological regions. Examples include the Soil, Water and Nutrient Management Program, the System Wide Livestock Initiative, the Desert Margins Program and the African Highlands Initiative. In each case, a people-centred rather than technology-driven approach is taken.

Within Sub-Saharan Africa, the Prospectus also identifies other contributions to research networks involving the CGIAR. Such networks linking researchers from different parts of Africa include the Eastern and Southern Africa Rootcrops research network, the Alley Farming Network for Tropical Africa, the African Network for Agroforestry Education and the Eastern and Central African Beans Research Network. PLaW is also involved in developing research capacity among NGOs and has linkages with universities within Canada. Given IDRC's limited budget, an emphasis on supporting networks is essential. PLaW brings to this area its extensive experience in supporting research into food and water security, in developing policies on the basis of this research, and in ensuring the communication of the research experience.

PLaW also has comparative advantage in terms of its experience in engaging in research involving conflict resolution. Most obviously this is evident in the Joint Israeli-Palestinian Management of the Mountain Aquifer project. The reviewers suggest that the PI might well be more explicit about their expertise in this area.

The Prospectus does not cover the full territory of 'who is doing what' globally in the various research domains of interest to PLaW, nor does it identify IDRC's niche within it. This would be a highly onerous task to undertake, and impractical in the context of the Prospectus. The reviewers suggest that the PLaW team might wish to consider whether it would be worth undertaking more complete strategic analyses of specific problems on a sub-program basis (e.g. for groupings of projects tackling the same problem or set of problems). Is there, for example, an overall strategy for tackling soil fertility problems in Sub-Saharan Africa or in a specific ecoregion within it? If so, what would be its components and where would PLaW's and IDRC's input fit? If not, why not, and should the PLaW PI make this one of its objectives? At the same time, the reviewers note that the PI team has chosen to use as programming criteria innovativeness of the proposed research and its non-redundancy with 'the complex of projects being implemented by others', (PLaW 1997:4) and endorses this approach.

2. Implementation of PLaW strategy

In assessing the PLaW program's fit with the Prospectus, this part of the review focuses on key issues raised in Part 1 using as an evidential base annual reports, comments from POs, project summary sheets and, for five projects, key project documents. The five projects chosen for review are:

-Water Demand Management Research Network (97-8601)
-Joint Israeli-Palestine Management of the Mountain Aquifer (95-0008/98-0210)
-Local Management of Natural Resources (98-8910)
-La communication participative en appui à des actions communautaires de lutte contre la Désertification au Sahel (97-0222)
-African Highlands Resource Management (94-8509 and 98-8548)

The projects were chosen from a list of twelve projects selected by the team on the basis of representing the diversity of research initiatives of the PI (water and land management), stage of development of the projects, region, and whether the project involved the creation of a network.

The reviewers' overall conclusion from a study of both general and specific documentation is that the PLaW program is indeed coherent with the Prospectus with regard to its stated objectives, its conceptual framework and its methodological approach. The specific projects examined in depth confirmed that PLaW is successfully addressing the significant issues raised in Part 1 above.

2.1 Process of consultation in development of activities

The reviewers found substantial evidence that the PLaW team members engage in extensive

consultations with others interested in addressing the same problematique of sustainable land and water utilization in its region of interest. These consultations are conducted on both a geographic basis to determine regional programming priorities and opportunities as well as on a sectoral or problem-oriented basis. The history of IDRC involvement in the area and the fact that many of the PLaW program activities involve networks greatly facilitates such consultation.

The African Highlands Resource Management Project (East Africa) II (AHRM II), part of the African Highlands Initiative II (AHI II), exemplifies the strength of this process of consultation. AHI II is a fundamentally collaborative research program, linking international and national research centres, extension agencies, NGOs and farmer groups. Organizationally, it is located under the umbrella of the Association for Strengthening Agricultural Research in East and Central Africa (ASARECA) and is a component of the Global Mountain Initiative of the CGIAR. AHRM II emerged through a process of lengthy consultation with these bodies and is currently financially supported also by the Swiss Development Corporation and the Government of the Netherlands.

As a second example, the Local Management of Natural Resources Project engaged in a long period of negotiation with key institutions in South Africa and Zimbabwe to develop the research: the Programme for Land and Agrarian Studies (PLAAS) at the University of the Western Cape and the Centre for Applied Social Studies (CASS) at the University of Zimbabwe. The former, with experience in the area of land tenure reform and rural livelihood and farm-household production studies complemented the experience of the latter in multidisciplinary research and participatory methodologies.

Similarly, a long period of consultation led to the creation of the Water Demand Management Research Network (WDMRN) in 1998. IDRC had been involved in supporting different components of water management since the early 1990s through over a dozen projects, linked through an informal network of researchers. The consultative process included a roundtable in 1993 of IDRC supported researchers, a workshop in 1994 as part of the Pan-African Initiative, several background studies conducted in 1996 following recommendations of this workshop, and a planing workshop in 1997 to discuss these studies and to set the stage for the establishment of the WDMRN.

In the development of activities, the reviewers note that the PI team not only responds to recipient requests but is also active in initiating activities itself. Many of the latter are 'networks', several of which are reviewed below. Others bring together information, e.g. funding production of a book on 'Food security through enhanced soil productivity' or the 'Water Hyacinth Information Clearinghouse'. The reviewers are completely supportive of such PI- initiated activities given the extensive experience of IDRC staff and the links they have with a wide variety of stakeholders. The major requirement in PI-initiated activities should be the existence of a strong and incontestable demand-pull for them. With regard to this issue, the importance the PI team attaches to the demand for the research coming not only from the research community but also from the intended users and/or beneficiaries of the research results is not always clear. As the PI team is aware, in general, if a research effort is addressing a problem or

need strongly felt and articulated by the end-users, it greatly increases the chances of success. The reviewers note the 'forceful attempts' (to quote one of the Regional Directors) to involve African researchers more actively not only in the development of its projects but also in evaluation and in training project recipients. Thus, PLaW has recently developed a project with OSSREA (the Addis Ababa-based Organization for Social Sciences Research in East and Southern Africa) which, in the words of one PO, 'aims at using African capacity in a new and innovative way'. African social scientists are to provide input into the social and gender analysis of PLaW projects, the objective being to promote the integration of social science into environmental resource management research. OSSREA members will, in addition, be involved in project evaluation. The reviewers strongly supports this development.

2.2 Activities in relation to PI objectives

2.2.1 Conceptual issues

With respect to the conceptualisation of the research problematique, the Local Management of Natural Resources (LMNR) project, based in South Africa and Zimbabwe, is useful in terms of indicating how a very recent project is successful in addressing issues raised in Part 1. The project's objective is, 'through a network of key actors in the field, [to] promote a broader and deeper understanding of how natural resources can be used and managed sustainably through group based institutions and decision making'(Project Description Summary). The project draws on the research of many scattered projects in the field of LMNR in Southern Africa in order to generate lessons learned. The development of a regional network is not 'an end in itself, but ... a means to an end'. Community groups, researchers and policy makers are explicitly mentioned as members of the network. Second, the project locates the question of resource management firmly within a political economy framework. The explicit focus is on local community responsibility for natural resource management (NRM) in the context of a trend towards greater individual ownership of resources and growing poverty on the one hand and, on the other, increasing devolution of authority over the resource base. The project views community based natural resource management (CBNRM) as 'the indigenous framework for rural production in Southern Africa' and considers that 'the disintegration of such systems spells impoverishment and degradation for large populations' (Project Proposal, p.1). The project recognises the need to do research into 'the political economy of co-management in order to allow disadvantaged groups to better understand the process and hence less likely to find themselves being taken advantage of'. Third, property, and specifically common property, is a central concern in terms of understanding the sustainability of environmental management. Common property regimes here include multiple land use systems, range management, forest resources, wildlife, fisheries, water and catchment area management. Fifth, the notion of 'community' is problematised (Project Proposal, p.9), and the concept of 'group governance of natural resources at the local level' is proposed. Finally, the project proposal indicated the need for the study to locate the research question with reference to social and gender analysis. One instance of this is to look at the question of whether CBNRM gives more secure rights to women than individual modes of tenure. The project includes a comprehensive communications strategy, discussed in Part 3.2.

A key conceptual strength of a second project, the AHRM II lies in its commitment to multidisciplinary research. As one of a number of projects which are part of the African Highland Initiative II, its overall objective is to 'improve the nutritional security and income of agricultural communities through maintenance of a sustainable resource base in the intensively cultivated highlands in eastern Africa' (AHRM II Project Proposal). At the broadest level AHI II involves 'participatory agrosystem management', changing from an earlier AHI research-led approach to a 'geographically oriented, farmer-led approach to priority setting' (Second Regional Steering Committee Meeting Draft Report 1999:8). It is considered 'unique' in linking productivity to sustainability in a 'holistic way' (*ibid.* :11). It supports 'systems, participatory and integrated multidisciplinary approaches to natural resource management at the community and/or watershed level' (*ibid.* :12). AHRM II supports research informed by this framework at two of the nine benchmark locations, one in Uganda and a new site in Tanzania. The project aims to improve the integration of the biophysical and social science beyond that which obtained in AHRM I. Specific attention is to be given to the resource poor and gender aspects, indigenous knowledge is recognised as a critical component in NRM, and the intention is to extend collaboration to non-traditional stakeholders, including those at the local level. In line with thinking in earlier project documents (for example, AHRM I Appraisal, 1994:5), gender is recognised in the project documents (AHRM II 1998:11). But the reviewers recommend that the team consider integrating gender and other dimensions of social difference more clearly into the conceptual framework of the proposal. Unless gender and class are fully recognised at this level, for example with respect to tenure issues and decision making in NRM, it is more likely that the biophysical aspects of NRM will be emphasised at the expense of social science questions, as was the case with AHI I (Braun, Smaling, Muchugu, Shepherd and Corbett 1997:102).

The Joint Israeli-Palestine Management of the Mountain Aquifer project, currently in its third and final phase, is of outstanding significance with respect to the observations made in Part 1 about the need to engage more directly at the level of conceptualization and methodology with the issue of conflict resolution. This project seeks to identify management structures for an aquifer shared by different legal jurisdictions. Bringing together multiple stakeholders to address the issue is of the essence in the project since Palestinian and Israeli researchers are joint executors. According to the Program Officer in charge of the project, the project has also brought together the multiple perspectives of hydrologists/geologists and social scientists. The solution to the physical problem can only be found if new institutional mechanisms are 'invented' and put into practice - and this is the objective of the project itself. The mechanisms sought in turn require wholesale changes in attitudes regarding joint management, and the nature of the working relationship between the different jurisdictions. The dangers in not finding workable solutions to the problem are both environmental and human as well as political, since access to water from such an aquifer could easily become a flash-point for future conflict. The charged context of the Israeli- Palestinian peace process provides the dynamic backdrop against which this search for creative approaches has been undertaken to date. Within this very difficult context the Palestinian and Israeli cooperating institutions have been successful in meeting the objectives of the previous phases.

One reviewer (GS) would like to make two further points. First, from an examination of the

projects being funded by the PLaW PI, it appears that there are a few which extend beyond the Prospectus's stated focus on 'soil productivity', e.g. those dealing with a particular crop such as banana or cassava or with an input such as Neem pesticide. They do not form a major part of the program and there may be historical or other reasons (some are new projects) why the PI is involved in these activities. The reviewer invites the team to make explicit the links between such activities and the research focus identified in the Prospectus or, alternatively, to modify the self-imposed restriction. Support to broad initiatives such as the East and Central Africa Program on Agricultural Policy Analysis (ECAPAPA) also likely extends beyond a focus on soil fertility or productivity issues. Again this is quite appropriate, especially in cases where the objective is the strengthening of important institutions.

Second, it is noted that the Prospectus also indicates that research on bio-physical factors will be included in the PI's work only inasmuch as it is a complement to a better understanding of socio-economic factors. The reviewer believes it would be useful to explain the rationale for this important exclusion in the Prospectus. At the same time, it is evident from the list of projects funded by the PLaW PI that several activities, some but not all of which predate the PI, do indeed deal with bio-physical factors. Again, some explanation in the next round of the strategic choices made on these issues would be useful.

2.2.2 Research methodology

As noted earlier, PLaW team members cited as one of the team's major accomplishments the increasing multidisciplinarity in the way it operates and in the activities it funds. Several POs indicated the ongoing challenge of finding better ways to work in truly interdisciplinary and intersectoral fashion, but the reviewers would like to commend the team very highly for their commitment to the achievement of this objective and the significant steps taken in this direction.

In addition to the success in this area of the AHRM II project and the LMNR project identified above, the Water Demand Management Research Network (WDMRN) is an example of the implementation of a multidisciplinary approach to research. The Network's general objective is 'to establish and promote a formal water demand management research network in the Middle East and North Africa aiming at enhancing applied research and the effective dissemination of research findings to policy-makers, major water end-users and the public'. Nine specific objectives are identified in the project document to attain this overall objective, including the provision of a forum for discussion, encouragement of coordination and cooperation, financing of research activities, capacity building, compilation of research resources including relevant data bases, dissemination of research results, and establishing linkages with similar networks. The network intends to emphasise the promotion of multidisciplinary research integrating social equity issues with efficiency and sustainability aspects of water demand management. Special attention is to be given to the participation of women and the inclusion of gender analysis in the research process.

The participation of stakeholders in the research process is a second area of concern for the PLaW PI and the reviewers again strongly commend the team for its evident commitment to this

principle and the innovative ways in which such participation has been pursued. The project entitled La Communication participative en appui à des actions communautaires de lutte contre la désertification au Sahel is an example of the direction in which the team is working with this issue. Implemented by the Projet d'appui au développement local au Sahel (PADLOS), part of the Comité permanent inter-Etats de lutte contre la sécheresse dans le Sahel (CILSS), the project responds to the Convention internationale de lutte contre la désertification (CCD) initiated at the Rio Summit in 1992 which places people and local participation at the centre of efforts to combat desertification. The PLaW PI was involved proactively in the development and planning of the project through a long process of exploration and discussion and drew on the conclusions of the study *'Lessons Learned from IDRC-Supported Research Projects on Desertification and Land Degradation'*(1994) to develop the proposal.

Central to the project are action-research activities conducted sequentially in three separate countries to develop participatory communication strategies with local groups and organizations working with them. The intention is that communities will develop their own communication networks rather than being passive recipients of information formulated elsewhere. The Project Summary correctly identifies the communication tools and institutional participatory approaches that will be necessary in the long-term to allow communities to exercise choices and make their own informed decisions. The main question in the minds of the reviewers is to what extent this project is a 'Participatory Technology Development' activity as well as being a 'Participatory Communication Strategy Development' project. The term 'technology' is used here to mean direct interventions/actions which need to be undertaken to counter the physical problem of desertification, as opposed to 'communications technology'. The Project Summary appears to focus on the 'Participatory Communication Strategy Development' aspect only.

The AHRM II is a second example of effective collaboration between researchers and stakeholders. In this case, in each of the two sites chosen for study, a steering committee with representation of the stakeholders has been established. The emphasis is on a community participatory approach in order to allow a deepening of the process of farmer participation in the research process, one of the objectives of the project. One of the interesting outcomes of the participatory approach in one of the sites, Kabale, Uganda, has been the research carried out by farmers themselves on the 'mouse bird' problem. Farmers are now teaching each other about their findings (AHI Annual Progress Report 1997/1998:11). A further point of methodological significance in this project concerns the question of 'scaling up' which is facilitated through the extensive linkages established at the regional level. There is connection among the research participants at the nine sites funded under the AHI II.

It is also relevant to note with respect to AHRM II that, according to the AHI Annual Progress Report 1997/98 (p.7), the AHI has won a two year fellowship under the System-wide Initiative for Participatory Research and Gender Analysis which will allow the recruitment of a rural sociologist or anthropologist specializing in participatory methods and NRM. The reviewers consider this to be an important initiative which could lead to the critical use of PRA methods. In view of ensuring that issues of social and gender analysis are addressed in the research, it would also be appropriate that the researcher have experience in these areas. At present, there appear to be few social scientists involved in the AHI.

3. Outputs, reach, impact

3.1 Outputs

The reviewers were impressed overall with both the quality and quantity of outputs produced from the work supported through the PLaW PI. There is evidence, most recently from the Annual Report 1998/99, that the PI is concerned to ensure that project outputs are in forms that address the needs of a wide audience and that communication, as stated in PI Objective 3, is an integral part of project design. The reviewers commend the deeper attention to this third objective in the current Annual Report and that, as part of 'championing "development communication" (p.6), the PI will develop a toolkit for researchers drawing on its experiences in this field.

Outputs include academic publications (books, articles), workshops and workshop reports, conferences, the establishment of networks, capacity building and training and the production of videos. To demonstrate the range and significance of outputs from research funded by the PLaW PI, the reviewers draw brief attention to some of the significant information provided for the two projects chosen for in depth analysis which have been in operation for a longer period of time.

As one of the two projects with a longer history than the others, the Joint Israeli-Palestinian Management of the Mountain Aquifer project has an extensive record of outputs. These include five workshops held during the course of Phases I and II, project reports, and a film on the mountain aquifer which features the project's key researchers. As the PLaW Annual Report 1998/99 notes, several of the publications concern the joint management of internationally shared aquifers, a particularly significant contribution to research given the lack of literature on this subject. The reviewers would particularly like to highlight the publication of these research findings by one of the POs in a forthcoming issue of the UN Department of Economic and Social Affairs Report (Annual Report 1998/99:8). In addition, Kluwer Scientific has accepted to publish a book resulting from the project, possibly the first on the joint management of internationally shared aquifers. Other significant documents include the Project Report for Phase II, subtitled, 'An implementation-oriented agenda'. This is a forceful policy statement making a strong case for the fact that 'the real choice the two sides face is a lose-lose situation if they do not cooperate and a potential win-win situation if they do' (Haddad, Feitelson, Arlosoroff, and Nasseredin 1998:2). The Phase II final report offers what to the review team appears to be a viable series of strategic options for consideration by policy-makers.

The third phase of the project will test the 'effectiveness and implications of proposed management structures ... using a simulation game ...' approach. Given the ground-breaking work being undertaken and the lack of real-life examples from which to draw conclusions, this methodology appears appropriate. The Phase III document states that one of its objectives is, 'To demonstrate the advantages and implications of joint management to a wide and possibly

sceptical audience of decision-makers' (Project Proposal 1998: p.3). The intention is to prepare both a technical summary of the simulation games as well as a public report for a more general audience, including decision-makers

As indicated previously, the AHRM II grew out of an earlier project and likewise is managed under the umbrella of the AHI. This entire project has been immensely productive with respect to publications. These include focused scientific reports which reflect collaborative research, such as that entitled, 'Relationships between bean stem maggot, bean root rots and soil fertility' (Nderitu, Burachara and Ampofo1997) and the more broadly focused publication, 'Maintenance and improvement of soil productivity in the highlands of Ethiopia, Kenya, Madagascar and Uganda' (Braun, Smaling, Muchugu, Shepherd and Corbett 1997), both of which appear in the Technical Report Series. The latter contains contributions from most of the partners in the AHI. This series is undoubtedly of high quality and reflects the strong historical emphasis in the AHI on research in the biophysical sciences. The reviewers would expect future research conducted under the AHRM II to address more explicitly the socio-economic aspects of soil productivity and food security, given the priorities in this project to these dimensions. The reviewers recognise, in light of this, that the PLaW has funded research by an intern into 'Gender and Soil Conservation in Africa' and that this research will be published as an IDRC Focus Book (PLaW Annual Report 1998/99:7). AHI publications also include workshop proceedings, extension leaflets written in a more popular style and a newsletter, AHI Update.

3.2 Reach

One of the key concerns of the PLaW PI, clearly expressed in the Annual Report 1998/99 (pp. 2-3), is the reach of activities in terms both of 'beneficiaries' and of 'partners'. Where beneficiaries, or their designated representatives, are also partners, the synergies of the research exercise may be expected to be greatest. In this regard, the PI is to be congratulated for its challenge in this Annual Report to researchers from formal institutions such as universities or independent/private research groups, including NGOs, or networks, to form effective partnerships with community groups or other institutions 'downstream'. The Annual Report gives the AHRM II as an example here. Although not mentioned in the Annual Report, it is evident from project documents that the Acacia project, whose objective is to contribute to 'the development of communities and the sustainability of natural resources in the intensively cultivated highlands of eastern Africa through the application of information and communication technologies' (AHI/Acacia Project Proposal 1997:4), is of vital significance here. The PLaW Annual Report 1998/99 also calls on researchers to link with research and capacity building institutions 'upstream' in order both to extend their reach - to 'scale up' - and to ensure technical back up where necessary.

In line with Objective 2, researchers are encouraged to engage with policy makers in the process of conducting the research (Annual Report 1998/99:3), a connection which the reviewers strongly endorse. The reviewers recognise, however, that this connection may sometimes be problematic for reasons to do with the political nature of some of the research proposed by the PI. In this regard, the reviewers would reiterate the need to address more squarely the question of

conflict resolution in the development of the research agenda.

In supporting the emphasis in PLaW on the formation of networks, the reviewers recognise the vital importance of these in extending the reach of the research activities and in ensuring that the research has a broad impact. The Water Demand Management Research Network (WDMRN) is an excellent example of effectiveness here. Now 'fully operational', the project has been successful during the last year in submitting for consideration a proposal for co-funding from the Arab Fund for Social and Economic Development (PLaW Annual Report 1998/99:5), a compelling indicator of the project's significance in the region. As stated in the Funding Proposal,

> In the long run, the Network is expected to provide a crucial impetus to promote applied research efforts on water demand management issues in the Middle East and North Africa. The active participation of practitioners, planners and decision makers in such a network will greatly enhance the likelihood that demand management practices, measures and policies will be promoted and adopted leading to a more efficient and sustainable management of the limited water resources in the region (WDMRN 1998:14).

In addition to the establishment of the Network itself, expected outputs include 20 to 25 small research projects, at least one major multidisciplinary multicountry project, a training workshop attended by fifteen participants, three thematic regional workshops, five country level workshops, several publications such as policy notes, workshop proceedings and books, an ambitious list.

The formal network is still in its infancy. The network coordinator is now in place at the IDRC Cairo office. A WDMRN Newsletter is produced in English and Arabic on a quarterly basis. A Web site dedicated to water demand management has been created which provides information about the network, news and current events and resources. While still in development it already provides some excellent linkages and the reviewers believe it has excellent potential. In addition support for three water demand management projects in the MENA region were approved from the Network's Research Grants Program. Of further significance is the fact that the Network is seen as a model for the development of similar networks in Sub-Saharan Africa. The PLaW Annual Report 1998/99 (p.13) notes that a new project, Water Demand Management Network Development (Southern Africa), provides evidence of the WDMRN's efficacy here and that similar efforts to establish networks are in the pipeline for East and West Africa.

The Local Natural Resources Management Research Network (LNRMN) (Southern Africa) project, approved and started during the past year, is an example of a second network project with enormous potential with respect to reach. Capacity building of partner institutions at the University of Zimbabwe and the University of the Western Cape is a key part of the research program. It is intended that the network will comprise policy and decision makers at all levels of governance, people responsible for natural resource management at the local level, NGOs and CBOs working in the area of NRM and the regional applied research community. The project aims to meet all three of the PI objectives, the research, policy and communication objectives being very closely linked. The extensive communication strategy includes workshops,

networking visits, a range of publications targeted to different stakeholders, newsletters, an academic book and a web site.

3.3 Impacts

Extending beyond outputs and reach, the issue of impact dogs all 'research for development' efforts. The reasons are manifold. First, the results of research efforts have to go through stages of dissemination, acceptance, utilization, before it can be determined that the desired ultimate impact was indeed promoted. It is also frequently difficult to fully ascribe causality between a particular research output and final impact. In the context of efforts to promote sustainable resource use, there is the inherent problem that the time horizon to measure impact adequately may extend over decades. The reviewers acknowledge that the issue of *ex poste* impact is especially difficult to address for a program such as the PLaW PI which is only a few years old. They consider that the question of impact might usefully be integrated into program planning processes more explicitly than is currently the case, for example by asking the question, 'What would happen next if the research is wildly successful?'

The PLaW Prospectus states that, 'For PLaW the impact of research is in the utilization of results'. In the view of one reviewer (GS), utilization of research results *leads* to impact. Differentiating between the two is useful inasmuch as research results may indeed be utilized but the impact may remain elusive or be very different from what was intended. One could also use terminology such as 'intermediate impacts' and 'final impacts'. The Annual Report 1998/99 implicitly acknowledges this when it refers to both 'target beneficiaries' and 'target partners' as being within its 'reach (p. 2). The same reviewer believes that it would be useful for the PI to articulate, *maybe for each set of linked activities*, on an *ex ante* basis, how research outputs are expected to be disseminated and utilized, and eventually to lead to the desired impact. Such an exercise would be carried out as part of a critical learning process. It is only by articulating a logical or conceptual model linking outputs to impacts at the start of a program initiative or activity that its validity can be tested *ex poste*, and true learning occur. In addition, if the links between outputs and impacts of a particular effort cannot be described during the planning stage, it is questionable whether the activity should be supported at all. Such a course of action may also help guide some of the strategic choices the PLaW PI team makes.

Having made the above general comments, the reviewers wish to recognise in this review some of the remarkable achievements of the PLaW PI that give an indication of the present or likely future impact of its activities. First, there is evidence of the development of working arrangements and research partnerships that are making a difference. One of the most visible examples of this comes from the Joint Israeli-Palestine Management of the Mountain Aquifer II project. As indicated in the PLaW Annual Report 1998/99 (p.6), the project is a significant component in the 'Second Track' negotiations between Palestine and Israel. As cited in the Annual Report (ibid.), the project is referred to in the work of the Water Resources Working Group of the Multilateral Track of the Peace Process, which is attended by representatives of 30 to 40 nations and international agencies. The research has demonstrated how 'the process of

sharing aquifer management is in fact a governance issue, and in this case, it shows the possibility of joint governance between Israel and Palestine'(ibid.). According to the Program Officer in charge of the project, the activity may indeed be having the impact of making the idea of joint management of the aquifer actually 'thinkable' - especially by Israeli authorities. This by itself would warrant the investment made in this project. As the Annual Report notes, the project has received much attention internationally.

It is also the case, albeit not in as dramatic a way, that the other projects reviewed here have effectively established research links which are likely to lead to the significant impact of research activities (see 2.2). The potential of the two network projects, the Water Demand Management Research Network and the Local Management of Natural Resources (Southern Africa), is outstanding in this regard. Both have established strong linkages outwith the research community. Further examples are given in the Annual Report. Of these, the reviewers draw particular attention to the Dead Sea Environmental Management Plan. PLaW's support for this Plan was one contribution which led to the Comprehensive Integrated Management Plan for the Basin, agreed to during a symposium held under the auspices of the Jordanian Ministry of Water and Irrigation. Stakeholders from throughout the region and the Deputy Director of UNESCO were present (PLaW Annual Report 1998/99:6).

Second, the impact of the PLaW PI's activities may be assessed on the basis of the historical depth as well as breadth of research in a particular area, combined with sustainable working relationships which have evolved over time. IDRC's ongoing commitment to the work of the Africa Highlands Initiative, most recently through AHRM II, is an excellent example. As noted earlier, AHRM II builds on earlier research experiences to re-evaluate its engagement with the principles of multidisciplinary and participatory research. Specifically, it intends to ensure the closer integration of biophysical and social science, to pursue research linkages with non-traditional stakeholders and to recognise the significance of social and gender analysis in the conceptualisation of research activities. Its strong links with the wider research community, and its basis for an effective communication strategy at the local level through the Acacia project, stand it in a secure position with respect to ensuring the impact of research findings. With respect more generally to the AHI, the results of research and methodological approaches used have permeated the work of commodity research networks in the region, institutions such as ASARECA, ICRAF and AFRENA, the approach that the European Union is taking towards supporting agricultural research in East and Central Africa, and national research institutes (PLaW PO). Further, in the words of the PO, 'The AHI is constituting a tangible setting in which community dwellers can participate in research while interacting with NGOs and other supporters in the process of production while becoming more aware of and pro-active in the protection of the natural resources they use'.

Third, the PLaW PI is to be commended for its commitment to linking research with policy and communication. It is very clear from the discussions of the reviewers with team members and from the recent PI documents that there is a profound commitment to including communication

strategies in project activities. The Annual Report 1998/99 (p.1) pays particular attention to this question, noting that this third objective of the PI relates not only to the dissemination of research results, 'but also to improving the way this is done to ensure understanding, appropriation and utilization of lessons built into those results by target groups'. This commitment is particularly visible in La communication participative en appui à des actions communautaires de lutte contre la désertification au Sahel. Through the methodology of action-research, research and communication are integrally entwined. The broader impact of the project is likely to come from the development of methodologies for participatory communication, the training of personnel in action-research methodologies, and the exchange of information among organisations involved in combatting desertification.

To the extent that it is possible to evaluate the impact of PLaW's activities at this point in time, and on the basis of the evidence available, the reviewers believe that the research in which the PI is engaged is influential, or has the potential for being influential, as suggested above. The growing number of prospective research partners who are becoming interested in the methodologies and approaches to research advocated by IDRC and the frequent call by partner institutions for consultations with PLaW team members is further evidence of this.

4. Concluding remarks

IDRC has been at the leading edge of promoting methodological innovation in research for development work. The research supported by IDRC generally, and by the PLaW PI specifically, intends to be systems-oriented, people-centred, participatory, multi- or interdisciplinary, and integrates social and gender analysis in identifying both causes of problems and assessing alternative strategies to overcome them. Such an approach evolved from the failure of more conventional, on-station, in-office, top-down, 'transfer of technology' methodologies to have much impact on target populations. This is especially true in marginal areas where decision-making is based on complex sets of criteria with high priority attached to survival and the minimization of risk.

The new paradigm attempts to deal with the complexity of decision making by individuals and communities and the consequent difficulty of predicting human behaviour. Its main premise is that involving end-users intimately in the development of alternative production or resource use practices will greatly increase the chances of development and adoption of these, since they will be responding to real needs and actual conditions.

There is not much doubt about the validity of this premise. At the same time the new research approach raises its own set of important questions. One of these concerns 'reach'. At one level, the PI addresses this issue through the support of networks which involve a broad range of stakeholders. But if the involvement of end-users is a *sine quo non* for adoption of research results, are there other ways of ensuring that impact does not remain restricted in scope? What other ways are there of moving from the particular research context involving a small group of rural inhabitants in a specific environment, to the infinite combinations brought about by large

numbers of different individuals or communities with widely variable skills and resources who are working towards different sets of objectives on different land types and cultivating different crops under different conditions? In addition, responsiveness to end-users will by its nature lead unavoidably to trial-and-error approaches making it more difficult to draw inferences.

In addition to the above conundrum, even when acknowledging the importance of multidisciplinarity or interdisciplinarity, biophysical scientists and social scientists still face significant difficulties in integrating data derived from their respective sciences. This is inherent in the different approaches used by the two groups. Biophysical scientists use knowledge of biological and physical processes to predict outcomes. The social scientists' domain of human behaviour and decision-making is much more complex and consequently making predictions may either be more difficult or, given the political nature of much research activity, inappropriate. In addition, how to transfer conclusions from socio-economic profiles and technology development/adoption studies from one location and context to others remains a major challenge.

From discussions with PLaW PI members, it is evident that these issues are indeed recognised and that innovative ways of thinking are emerging. PLaW's specific inclusion of a 'communication' objective is very relevant in this regard. In the view of one reviewer (GS), IDRC as a whole and the PLaW PI in particular could make a significant contribution to 'research for development' by addressing these challenging issues head on. A focus on the goal of large-scale developmental impact would exercise a different type of influence on PLaW's programming criteria. IDRC's motto is Empowerment Through Knowledge. On that principle and based on the above, the research question to be posed is how tested and validated knowledge of biophysical and social processes of sustainable land and water usage can be made available to end-users in accessible formats, enabling them to exercise their own choice. The development of tools such as expert systems may be one avenue among others worth exploring.

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April 26 1999. The two reviewers met with the PI team in Ottawa.

April 28 1999. The two reviewers met with the PI team leader.

During the months of May and June, the reviewer based in Ottawa, Fiona Mackenzie, met with Ola Smith, Guy Bessette, David Brooks.

All team members provided written submissions with respect to specific questions asked by the reviewers.

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